

Appl. No. 10/064,605  
Amdt. Dated December 7, 2004  
Reply to Office action of September 23, 2004

### **REMARKS/ARGUMENTS**

This case has been carefully reviewed in light of the Office Action dated September 23, 2004, wherein claims 1, 2, 5-9 and 12-14 are rejected under 35 U.S.C. §102(e) over Margiott, and claims 4, 11 and 15-18 are rejected under 35 U.S.C. § 103 (a) over Marglott in view of Wu.

Further to the Office action, Applicant discussed a few issues with the Examiner as summarized below, over a telephone call dated October 26, 2004.

Claims 1 and 7 have been amended and a new claim 19 has been added. Reconsideration of the rejections in light of the amendments, the discussion with the Examiner, and the following remarks is respectfully requested.

#### **Discussion Summary**

Applicant appreciates the consideration shown by the Examiner during the telephone call to discuss the pertinent issues and during the preparation of the Interview Summary. Applicant's brief summary of the discussion follows:

Applicant briefly discussed the salient features of the present invention in conjunction with Fig. 1 and Fig. 2. Applicant noted that in the present invention as shown in Fig. 1, the flow 210 gets divided in upper channels formed by upper ribs and the bottom channels formed by bottom ribs. Additionally, the plurality of the upper ribs 150 and the plurality of the bottom ribs 160 are typically in physical contact with each other. The upper channels formed by the upper ribs and the lower channels formed by the lower ribs are two different channels, wherein the flow directions in the channels are different as they are shown as being positioned at an angle relative to each other.

Applicant stated that, although Margiott broadly mentions hybrid flow channels which may be implemented in a straight flow field or a flow field which is folded one or more times, the channels are not configured to be on top of each other where they can be in physical contact with each other and there is no discussion of a top flow in a different direction from a bottom flow. Applicant submitted that folding of the flow field as shown in Margiott, is a flow path where the reactant is passing through a first flow passage, which may be straight channels and enters a plenum wherein the flow direction is changed before it enters in interdigitated channels. The "ribs" of Margiott, for example the straight channels and the interdigitated channels, would not appear to be in physical contact, even during the folding, because of the need for an intervening anode layer.

The examiner stated that the present claim language does not specifically reads as the upper

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and lower ribs being in physical contact and the different directions of flow in upper and lower channels. Accordingly it was proposed to further amend the claims to recite the upper ribs and the bottom ribs are in physical contact and the fluid going in different directions in the upper and bottom channels.

Rejections under 35 U. S. C 102 (e)

Claims 1, 2, 5-9 and 12-14 have been rejected as being anticipated by Margiott 2002/0086200. Applicant respectfully traverses the rejection.

Applicant submits that independent claims 1 and 7 have been amended to recite the limitation that the upper ribs and the bottom ribs are in physical contact with each other. The amended claims 1 and 7 further recite the limitation of the flow going in different directions in the upper and bottom channels. Margiott does not disclose all elements of modified claims 1 and 7, which are illustrated below (with emphasis added):

1. A cooling apparatus for fuel cell components comprising:
  - a base plate having a first end and a second end;
  - a first side plate coupled to said first end and a second side plate coupled to said second end;
  - a plurality of bottom ribs coupled to said base plate;
  - a plurality of **upper ribs in physical contact with bottom ribs**; and
  - a top channel and a bottom channel formed between each of said plurality of upper ribs and each of said plurality of bottom ribs, respectively,
  - wherein said top channel and said bottom channel are disposed to allow an initial flow of a fluid therethrough in a top direction through said top channel and a bottom direction through said bottom channel, the top direction and the bottom direction comprising different directions, and disposed to allow a portion of said fluid to alternate between said top channel and said bottom channel at a flow redirection area so as to enhance the heat transfer rate between said fluid and said fuel cell components.
7. A fuel cell assembly comprising:
  - at least one fuel cell having at least two electrodes and an electrolyte disposed therebetween;
  - at least one cooling apparatus disposed over at least one of said electrodes, said cooling apparatus comprising:
    - a base plate having a first end and a second end;
    - a first side plate coupled to said first end and a second side plate coupled to said second end;
    - a plurality of bottom ribs coupled to said base plate;
    - a plurality of **upper ribs in physical contact with said bottom ribs**; and
    - a top channel and a bottom channel formed between each of said plurality of upper ribs and each of said plurality of bottom ribs, respectively,
    - wherein said top channel and said bottom channel are disposed to allow an initial flow of a fluid therethrough in a top direction through said top channel and a bottom direction through said bottom channel, the top direction and the bottom direction comprising different directions, and disposed to allow a portion of said fluid to alternate between said top channel and said bottom channel at a flow redirection area so as to enhance the heat transfer rate between said fluid and said fuel.

Margiott et al. does not teach, suggest, or disclose a cooling apparatus comprising a plurality of

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bottom ribs coupled to the base plate and a plurality of upper ribs in physical contact with the bottom ribs. The device disclosed by Margiott et al. merely appears to describe a plurality of flow through reactant flow field channels and a plurality of interdigitated reactant flow field channels (claim 1). The fluid flow path is divided in a flow through reactant flow field and an interdigitated flow field wherein the fluid has to travel through the flow through reactant flow field before entering the interdigitated flow field.

In contract, the present application discloses the top channel disposed over the bottom channel, wherein the fluid is introduced in the top and the bottom channel simultaneously as indicated by Fig. 1. The flow redirection area 170 exists at the side plates as shown in Fig. 1 and Fig. 2. The flow directions in the upper channels and the bottom channels are in different directions as can be clearly seen in FIG. 2 by paths 240 and 250, for example. The upper rib and the bottom rib in the present application are disposed physically on top of each other, which is not disclosed or suggested by Margiott et al.

Claims 2 and 5-6 depend directly or indirectly from claim 1 and Claims 8, 9 and 12-14 depend directly or indirectly from claim 7. Applicant respectfully submits that modified claims 1 and 7 are patentably distinct from the applied references for the reasons discussed above and that claims 2, 5-9 and 12-14 are similarly allowable over the applied reference.

Furthermore, with respect to claims 6 and 14, Applicants specifically traverse the statement that Margiott describes this angle range (30 to 120 degrees) for rib disposition. The channels in Margiott all appear to be parallel, whether folded or not. When folded, the channels appear to be coupled via a 180 degree turn.

#### Rejections under 35 U. S. C 103 (a)

Claims 4, 11 and 15-18 have been rejected as unpatentable over Margiott 2002/0086200 in view of Wu et al. 2002/0026999. Applicant respectfully traverses the rejection.

Claims 4 and 17 depend directly or indirectly from claim 1 and claims 11 and 15-16 and 18 depend directly or indirectly from claim 7. Applicant respectfully submits that Claims 1 and 7 are patentably distinct from the applied references for the reasons discussed above. Therefore claims 4, 11 and 15-18 are similarly allowable over the applied references.

Accordingly, Applicant respectfully submits that the claimed invention defines allowable subject matter over the applied art. Withdrawal of the rejections is respectfully requested, and allowance of the claims is respectfully solicited.

#### New Claim 19

Claim 19 is similar to claim 1 except that the physical contact recitation is not present and an angle of difference is recited. The angle of difference consistent and supported by original claims 6 and

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14. Applicants respectfully submit that no combination of Margiott and teach, suggest, or disclose these recitations.

Summary

Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Should the Examiner believe that anything further is needed to place the application in even better condition for allowance, the Examiner is requested to contact applicant's undersigned representative at the telephone number below.

Respectfully submitted,

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